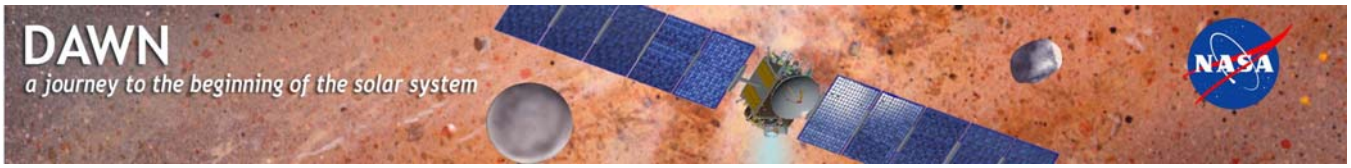

Ion Propulsion

Timeline

STUDENT INFORMATION SHEET

1906	Dr. Robert Goddard mentioned the possibility of accelerating electrically charged particles to very high velocities without the need for high temperatures.
Early 1920's	Dr. Wernher von Braun and Dr. Hermann Oberth introduced the possibility of electronic propulsion. Oberth proposed an "electric rocket."
1939	A chapter in Oberth's book *Possibilities of Space Flight* addressed problems of electric propulsion systems.
1947	von Braun told Ernst Stuhlinger, "I wouldn't be a bit surprised if we flew to Mars electrically."
1955	Stuhlinger presented a paper at the International Congress in Vienna entitled, "Possibilities of Electrical Space Ship Propulsion."
1958 (April)	Army Ballistic Missile Agency in Huntsville, Alabama initiated its first electrical propulsion contract.
1960's	Major advances in ion propulsion included multi-aperture grids, mercury vaporizers, long-life oxide main cathodes, plasma bridge neutralizers, and discharge chamber hollow cathodes. The major development programs included 5, 10, 20, 50 and 150 cm thrusters.
1961 (August)	Hughes Research Laboratory in Malibu, California, under contract with the Marshall Space Flight Center in Huntsville, Alabama, demonstrated an ion engine.
1962 (December)	Program 661A Test Code A – The first of three sub-orbital flight tests was launched of the Electric Propulsion Space Tests. Engine thrusting was not accomplished in this test.
1964 (July)	The Space Electric Rocket Test (SERT I) spacecraft was launched using a Scout launch vehicle. This flight experiment had an 8-cm-diameter cesium contact ion engine and a 10-cm-diameter mercury electron bombardment ion engine and was the first successful flight test of ion propulsion.
1965 (April 3)	A SNAP 10 A nuclear power system was launched into a 1300-km orbit with a cesium ion engine as a secondary payload.
1968 (August 10)	Two cesium-contact ion engines were launched aboard the ATS-4 spacecraft. This was the first successful orbital test of an ion engine.
1968	Science Fiction: Ion propulsion was mentioned in Star Trek episode "Spock's Brain."

Early 1970's	The Solar Electric Propulsion Stage program's goal was to provide a primary ion propulsion system capable of operating at a fixed power for Earth orbital applications or over a wide power profile such as would be encountered in planetary missions. This multi-center, multi-contractor effort was ongoing for about 10 years.
1970 (February)	The SERT II spacecraft was launched into a 1000-km-high polar orbit. In addition to diagnostic equipment and related ion propulsion system hardware, the spacecraft had two identical 15 cm diameter, mercury ion engines and two power-processing units.
1974 (May)	The ATS-6 was launched. One of the ion engines operated for about one hour and the other for 92 hours. Both of the engines failed to provide thrust on the restarts due to discharge- chamber cesium flooding.
1977	Science Fiction: Ion propulsion used in the popular Star Wars movie on the Twin Ion Engine (TIE) fighters.
Early 1990's	Jet Propulsion Laboratory and NASA Lewis partnered on the NASA Solar Electric Power Technology Applications Readiness (NSTAR) project.
1996 (June)	A prototype engine built by NASA Lewis began a long duration test in a vacuum chamber at JPL simulating conditions of outer space.
1997 (September)	NSTAR test concluded after over 8,000 hours of operation
1998 (October)	Deep Space 1 launched. DS1 is the first spacecraft to use ion propulsion to reach another planetary body. NASA's Jet Propulsion Laboratory initiated an extended life test of the NSTAR thruster - a flight spare thruster identical to one flown on the successful Deep Space 1 mission. This test was concluded on June 30, 2003, after 30,352 continuous hours of operation.
2001	NASA's Office of Space Science selected Glenn Research Center to develop a next generation ion propulsion system called NASA's Evolutionary Xenon Thruster (NEXT) system.
2002	NASA Glenn Research Center was selected by NASA Headquarters Office of Space Science, Solar System Exploration Division, under a competitive NRA to develop high-power electric propulsion for nuclear systems.
2003 (August)	At the end of NEXT Phase 1, NASA's Glenn Research Center (GRC) had successfully demonstrated system level performance of an engineering model thruster, a power processing unit and a propellant management system at power levels in excess of 7.0 kW.
2004 (April)	43 ignitions and over 6000 hours have been accumulated on a single unit of the Plasma Contactor Unit (PCU) which was developed by the Rocketdyne division of the Boeing Company to control charging of the International Space Station (ISS).
2007 (Summer)	Dawn spacecraft is scheduled to be launched. This is the first purely scientific mission to use ion propulsion.